Contribution ID: **58** Type: **Submitted**

INVESTIGATION OF 111mCd AND 117Cd IN Fe DOPED TiO2 AND SnO2 THIN FILMS BY MEANS OF PERTURBED ANGULAR CORRELATION SPECTROSCOPY

Wednesday 19 December 2012 10:20 (10 minutes)

Fe-doped thin films of the semiconductors SnO2 and TiO2 have been measured by means of the perturbed ⊠ angular correlation spectroscopy (PAC) in order to investigate the ferromagnetism and to study the electric quadrupole interactions. Important technological applications of these oxides [1,2], especially as candidates for diluted magnetic semiconductor [3] in the emerging area of spintronics, have been the chief motivation for this study. The films were deposited by sputtering process on the Si (100) substrate from a target with a purity of 99.999% and with an applied magnetic field of 500 G at the University of São Paulo and 2% of Fe were ion implanted using the ion implanter, Bonn Isotope Separator (BONIS) at the University of Bonn. The thickness of these films were 100 nm and the implantation of 111mCd or 117Cd was made at ISOLDE. The thermal treatment for the samples using 111mCd as probe nuclei was done in vacuum for 10 minutes at 873 K. The samples with 117Cd implanted underwent thermal annealing in air for 10 minutes. The hyperfine parameters were systematically studied as a function of measurement temperature. The thin films were characterized by energy dispersive spectroscopy (EDS) and scanning electron microscopy (SEM) and the results indicates that the samples were homogeneous and without impurities. The PAC results show the presence of electric quadrupole interactions for both the oxides. One of the interactions corresponds to the value of rutile for both the oxides.

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Session Classification: Solid State Physics